

## ENGINEERING INVENTIONS.

A semaphore signal has been patented by Mr. William Thornburgh, of Elyria, Ohio. With an upright frame, having tubular standards, sliding rods, and wings, a lantern box and glass sides, are various novel details and combinations for governing and regulating the movements of railway trains at crossings, drawbridges, block stations, etc.

A valve gear for engines has been patented by Mr. Francis C. Simonds, of Kennebunk, Me. This invention covers such special construction and arrangement of parts that the full pressure of steam will be on the engine at all times, and the amount allowed to enter the cylinder will be regulated by the greater or less opening of the valves by the regulator, according to the load.

A railroad signal system has been patented by Messrs. William Hadden, of Brooklyn, N. Y., and Henry Van Hoevenberg, of Elizabeth, N. J. A continuous electric current is employed for holding signal banners in position to indicate safety, and the current is rapidly interrupted to weaken the power of the signal magnet and allow the signal banner to fall to indicate danger, this being effected by a peculiar combination of track instruments, interrupters, and magnets.

## AGRICULTURAL INVENTIONS.

A horse hoe has been patented by Mr. Marcus Hardenbrook, of Marysville, Kansas. It is made with fenders upon the inner ends of the hoes to protect small plants from the soil thrown by the hoes, and there are readily adjustable gauge wheels and standards, the object being to facilitate the cultivation of small plants.

A sulky harrow has been patented by Messrs. Armelder F. Pack and Edwin French, of Emporia, Kansas. This invention covers improved appliances for raising up the harrows to suspend them from the axle when required, and to lower them to the ground again, the object being to simplify the appliances, improve their efficiency, and lessen the labor of operating them.

A cultivator has been patented by Messrs. Fred Hani and Charles A. Billington, of Morrill, Kansas. It is made with curved bars or runners, and inclined beams connected at their forward ends with each other and the curved bars by upright bars having horizontal overlapping upper ends, connected at their rear ends by an adjustable arched bar, and provided with cutters and fenders, the cultivator being especially adapted for cultivating small corn planted in furrows between the ridges in listed land.

## MISCELLANEOUS INVENTIONS.

A fruit and flower stand has been patented by Mr. George W. Fry, of Beaver, Pa. It is formed of a series of bowls or dishes united by detachable standards, a sprinkler and water receptacle being held on the uppermost stem, the whole being so constructed that it can be taken apart and compactly folded.

A tallying attachment for measures has been patented by Mr. James A. McIntosh, of Warren, Pa. This is for vessels employed to measure liquids, to record the number of times the measure is emptied, and consists of a sliding handle, with an index moving in front of a dial, carried by a pawl and ratchet attachments operated by the sliding handle.

A camera has been patented by Messrs. William H. Lewis and Erastus B. Barker, of New York city. This invention covers certain novel features intended to make a lighter and more convenient instrument, and relates particularly to the folding bed, the means for securing the object glass in place, and the construction of the box.

A wagon top has been patented by Mr. Charles R. Parks, of Arkadelphia, Ark. In combination with a wagon box having longitudinal pockets on the sides is a removable wagon top, with base rails adapted to be passed into the pockets to hold the top on the wagon box, the pockets being fixed or removable.

A culinary vessel has been patented by Emily A. Stears, of Brooklyn, N. Y. This invention relates to vessels for cooking various kinds of food simultaneously, a tray, with sector shaped pan, fitting into a larger vessel, with convenient devices for passing off the vapors, allowing of a number of different dishes to be conveniently cooked at the same time.

A mail bag has been patented by Mr. Chas. F. Walters, of Prospect, N. Y. The bag is made of leather similarly to those now used, but has a novel sectional construction at and near the mouth end, and in the fastening, so that when being filled or being dumped the mouth is held open to present a full and clear opening.

An amalgam for filling teeth has been patented by Mr. Walter C. Davis, of St. Petersburg Place, Bayswater, Middlesex Co., England. Amalgam filings are coated, by a special process, with a varnish of gum and gold dust, so that each individual grain or particle of the amalgam is protected from the action of the atmosphere or the acid secretions of the mouth.

A barbed fence strip has been patented by Mr. Elbert E. Hawkins, of Wilkesbarre, Pa. The strip is bent to have a U-shaped cross section, and has tongues at the top edge punched alternately out of opposite sides of the strip, extending alternately in opposite directions, the strip being easily made from sheet metal.

A fire escape has been patented by Messrs. George H. Herrington and Martin Heller, of Wichita, Kansas. It consists of one or more wires or rope ropes attached outside the building conveniently near the windows or doors of the different stories, and having successive guards of stirrups and loops, whereby persons may descend in case of fire.

A pump has been patented by Mr. John J. Bircher, of Wilmot, Ohio. This invention covers a novel construction in double acting pumps with a single barrel and duplicate valvular suckers, arranged to re-

ciprocate toward and from each other, in order to obtain increased efficiency and simplicity, and a better working effect.

A freight elevator has been patented by Mr. Charles B. Paxton, of Vicksburg, Miss. It is more especially designed for loading and unloading boats at low stages of water, the construction allowing the stage, with elevating chains, to be raised and swung to the required height and position for the upper end to rest upon a dock or shore.

A process of making bread has been patented by Mr. Theophile Monierichard, of Paris, France. This process consists in mixing with the flour to make the dough water in which a small proportion of wheat has been previously boiled, then kneading and proceeding as in ordinary bread making, the water used being thus prepared to assist the separation of the glucose from the dextrine, give more body to the remainder of the dough, and increase the product of bread.

An apparatus for distilling has been patented by Mr. Franz Konig, of Asti, Italy. This invention provides a simple and inexpensive apparatus for distilling brandy, spirit, petroleum, etc., by passing their vapors through one or more chambers, over surfaces giving great exposure, and by contact of the vapors with the liquids, it being claimed possible therein to produce rectified alcohol of from 90° to 93° from fermented mash in shorter time and with less expense than by other usual apparatus.

A driving mechanism for clay tempering wheels has been patented by Mr. William Cram, of Raleigh, N. C. It is made with a fixed circular rack and a horizontal shaft rotated by suitable gearing and carrying a pinion meshing with the teeth of the fixed rack, the shaft being connected to the shaft of the tempering wheel, so tempering wheels may be operated with less power.

A safety lamp has been patented by Mr. Robert Mauchline, of Shenandoah, Pa. This invention covers a novel construction and arrangement of parts, making a lamp intended to show double the halo of a Davy lamp, and to indicate gas when the percentage is smaller than will be detected by the Davy lamp, and one that will be extinguished when raised into gas such as would endanger the bursting of a Davy lamp.

A canister for holding or measuring seeds, grain, or other substances has been patented by Mr. George S. Church, of Baldwin, Mich. The lower end of the canister is connected with a bell mouthed spout, to the lower end of which is secured a measuring tube, and by various novel devices the whole may be connected with a grain spout and used for measuring, or it may be used for storing and measuring rations for horses, etc.

A method of transforming Jerusalem artichoke juice into levulose and applying the product has been patented by Mr. Edmond L. J. Boniface, of Changy-les-Bois, par Varennes, Loiret, France. The method covers the application of an acid at a temperature of about 100 deg. Centigrade, either in open air or under pressure, and ways for the use of levulose in making alcohol, the manufacture of sirup, a special beer, levulose beer, and hygienic beverages, etc.

## NEW BOOKS AND PUBLICATIONS.

**DIE KABELTELEGRAPHIE.** (Cable Telegraphy.) By Max Jullig. A. Hartleben, 1884. Wien, Pest, Leipzig. 256 pages.

This interesting work contains valuable information on the construction, insulation, and laying of underground and submarine cables, and a very interesting history of the use of cables from the first attempt made by Lesage at Geneva, in 1774, to the Bennett-Mackey cable of 1884. The electrical functions in cables, the instruments used in transmitting cable messages, and the relative values of insulating materials, have received special attention. The work contains 90 illustrations and diagrams.

**FIFTY YEARS' OBSERVATION OF MEN AND EVENTS.** By Gen. E. D. Keyes, U. S. A. Charles Scribner's Sons, New York.

The writer was for many years on the staff of Gen. Scott, and a great portion of the book is devoted to anecdotes in which that military chief figured, and reminiscences of the times in which he was a prominent figure in public life. The reader is never allowed to forget the personality of the author, and the part he had in military movements before and during the war, but the book is, withal, a sketchy and entertaining volume.

**THREE VISITS TO AMERICA.** By Emily Faithfull. Fowler & Wells Co., New York.

As is well known, Miss Faithfull has for more than twenty years devoted herself to the enlargement of the field of labor for women, and her visits to this country have been for the purpose of studying our industrial methods and organizations in behalf of poor women. She is a warm hearted, practical observer, earnestly laboring for the improvement of the condition of women, and received many attentions while here from leading people in all walks of life. This volume describes, in entertaining style, her experiences in this country.

**THE LEATHER MANUFACTURE IN THE UNITED STATES.** By Jackson S. Schultz. Published by the *Shoe and Leather Reporter*, New York.

There is no other book now offered in the English language presenting anything like a satisfactory treatise on the manufacture of leather. Mr. Schultz comes to his task with advantages rarely possessed by an author, having been himself for more than a quarter of a century a prominent figure in the American leather trade. This volume, however, excellent as it is in its way, is altogether too brief, as it treats almost exclusively of the sole leather manufacture, but on this branch of the subject there is little left to be said. The book has a valuable appendix, giving full details of the methods adopted by the tanners of Pennsylvania and New York for burning wet spent tan, which furnishes abundance of power for operating all our sole leather tanneries.

## Business and Personal.

*The Charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.*

Catalogue of Books, 128 pages, for Engineers and Electricians, sent free. E. & F. N. Spon, 35 Murray Street, N. Y.

Wanted.—Heavy Coil Springs. M. Belanger, Ottawa, Canada.

Wanted.—To correspond with works, corporations and cities desiring first-class, and at the same time low cost, electric light plants, with or without engines and boilers. "S. C. Forsaith Machine Company, Manchester, N. H."

After almost four years' practical experience in the use of the Remington Type-writer in our office, we find it is an indispensable aid in handling our correspondence. We would not want to be deprived of its use for any consideration, as we do not see how the place it fills could be supplied.

DOMESTIC SEWING MACHINE CO., Chicago. The Remington Type-writer is the one used by the United States Government. Wyckoff, Seaman & Benedict, 281 and 283 Broadway, New York city, sole agents.

Situation wanted by an experienced nickelplater. Address for three weeks, W. H. Wright, 128 Sixth St., Brooklyn, E. D., N. Y.

Brush Electric Arc Lights and Storage Batteries. Twenty thousand Arc Lights already sold. Our largest machine gives 65 Arc Lights with 45 horse power. Our Storage Battery is the only practical one in the market. Brush Electric Co., Cleveland, O.

Acoustic Telephone with magneto call bells, \$15 a pair. W. E. Lewis, Corry, Pa.

Practical Instruction in Steam Engineering, and situations furnished. Send for pamphlets. National Institute, 70 and 72 West 23d St., N. Y.

The Cyclone Steam Flue Cleaner on 30 days' trial to reliable parties. Crescent Mfg. Co., Cleveland, O.

For Steam and Power Pumping Machinery of Single and Duplex Pattern, embracing boiler feed, fire and low pressure pumps, independent condensing outfits, vacuum, hydraulic, artesian, and deep well pumps, air compressors, address Geo. F. Blake Mfg. Co., 44 Washington St., Boston; 97 Liberty St., N. Y. Send for Catalogue.

Quinn's device for stopping leaks in boiler tubes. Address S. M. Co., South Newmarket, N. H.

Mills, Engines, and Boilers for all purposes and of every description. Send for circulars. Newell Universal Mill Co., 10 Barclay Street, N. Y.

Wanted.—Patented articles or machinery to manufacture and introduce. Lexington Mfg. Co., Lexington, Ky.

"How to Keep Boilers Clean." Book sent free by James F. Hotchkiss, 86 John St., New York.

Stationary, Marine, Portable, and Locomotive Boilers a specialty. Lake Erie Boiler Works, Buffalo, N. Y.

Presses & Dies. Ferracute Mach. Co., Bridgeton, N. J.

For Power & Economy, Alcott's Turbine, Mt. Holly, N. J.

The Hyatt filters and methods guaranteed to render all kinds of turbid water pure and sparkling, at economical cost. The Newark Filtering Co., Newark, N. J.

Steam Boilers, Rotary Bleachers, Wrought Iron Turn Tables, Plate Iron Work. Tippet & Wood, Easton, Pa.

Send for Monthly Machinery List to the George Place Machinery Company, 121 Chambers and 103 Reade Streets, New York.

Iron Planer, Lathe, Drill, and other machine tools of modern design. New Haven Mfg. Co., New Haven, Conn.

If an invention has not been patented in the United States for more than one year, it may still be patented in Canada. Cost for Canadian patent, \$40. Various other foreign patents may also be obtained. For instructions address Munn & Co., SCIENTIFIC AMERICAN Patent agency, 361 Broadway, New York.

Guild & Garrison's Steam Pump Works, Brooklyn, N. Y. Steam Pumping Machinery of every description. Send for catalogue.

Nickel Plating.—Sole manufacturers cast nickel anodes, pure nickel salts, polishing compositions, etc. Complete outfit for plating, etc. Hanson & Van Winkle, Newark, N. J., and 92 and 94 Liberty St., New York.

Supplement Catalogue.—Persons in pursuit of information on any special engineering, mechanical, or scientific subject, can have catalogue of contents of the SCIENTIFIC AMERICAN SUPPLEMENT sent to them free. The SUPPLEMENT contains lengthy articles embracing the whole range of engineering, mechanics, and physical science. Address Munn & Co., Publishers, New York.

Machinery for Light Manufacturing, on hand and built to order. F. E. Garvin & Co., 130 Center St., N. Y.

Curtis Pressure Regulator and Steam Trap. See p. 286. Woodwork's Mach'y. Rollstone Mach. Co. Adv., p. 286.

Drop Forgings. Billings & Spencer Co., Hartford, Conn. We are sole manufacturers of the Fibrous Asbestos Removable Pipe and Boiler Coverings. We make pure asbestos goods of all kinds. The Chalmers-Spence Co., 419 East 8th Street, New York.

Clark's Rubber Wheels. See adv. next issue.

Steam Hammers, Improved Hydraulic Jacks, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

Emerson's 1884 Book of Saws. New matter 75,000.

Free. Emerson, Smith & Co., Limited, Beaver Falls, Pa. Hoisting Engines. Friction Clutch Pulleys, Cut-off Couplings. D. Frisbie & Co., Philadelphia, Pa.

Barrel, Keg, Hoghead, Stave Mach'y. See adv. p. 302.

Munson's Improved Portable Mills, Utica, N. Y.

Solid and Shell Reamers, durable and efficient.

Pratt & Whitney Co., Hartford, Conn.

Mineral Lands Prospected, Artesian Wells Bored, by Pa. Diamond Drill Co. Box 423, Pottsville, Pa. See p. 332.

For best low price Planer and Matcher, and latest Improved Sash, Door, and Blin Machinery, Send for catalogue to Rowley & Hearnance, Williamsport, Pa.

The Porter-Allen High Speed Steam Engine. Southwark Foundry & Mach. Co., 430 Washington Ave., Phil. Pa.

Split Pulleys at low prices, and of same strength and appearance as Whole Pulleys. Vocom & Son's Shafting Works, Drinker St., Philadelphia, Pa.

## Notes &amp; Queries

## HINTS TO CORRESPONDENTS.

Name and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.

References to former articles or answers should give date of paper and page or number of question. Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and though we endeavor to reply to all, either by letter or in this department, each must make his turn.

Special Information.—Requests on matters of personal rather than general interest, and requests for Prompt Answers by Letter, should be accompanied with remittance of \$1 to \$5, according to the subject, as we cannot be expected to perform such service without remuneration.

Scientific American Supplements referred to may be had at the office. Price 10 cents each. Minerals sent for examination should be distinctly marked or labeled.

(1) F. A. asks: What cement will best stick rubber bulbs to the ends of glass tubes (medicine droppers)? A. Heat the end of the glass tubes sufficiently hot, so that when the rubber is drawn over the tube it will melt slightly, and then adhere to the glass. 2. Do you suppose that the colors put up as dyes by several makers are subjected to any special process, or are they merely suitable aniline colors, put up in small envelopes for the convenience of small users? A. We are informed that the colors as put up in the manner referred to by you are simply small samples, and are not subjected to any special process.

(2) W. W. asks how to harden and color moulding knives on wood working machinery; the smith cannot get them even tempered. A. The profiles, or edges of the knives, are probably of curved form, one portion projecting more than another. No heating and drawing over a smith's fire can be even for such work. Heat the knives in red hot lead; harden in cold water; brighten and draw (in hot sand) to a "pigeon breast" red and blue.

(3) G. M. S. writes: There is something in the water, sulphur I think, which is rapidly eating holes into the feed pump rods and other parts of my engines, and probably ruining my boilers. How can I stop it? A. A little sal soda added to the feed water will probably neutralize any acid that may be cutting the interior of boilers and pump. If you feed from a tank, place the soda in the tank—1 or 2 ounces to 100 gallons. Blow off the boilers every day one or two cocks. You may find that much less soda will counteract the acidity. 2. How can I mend the broken drum of a cast 12 inch by 24 inch pulley? Can I cement it in any way? A. You cannot cement the pulley, but you can make a sheet iron rim for the inside of the pulley, one on each side about No. 16. Fit it in neatly, and rivet the broken pieces of the pulley to the sheet iron, also the parts that are not loose. If this is carefully done, you will not discover that it has been broken by its running. 3. Can I run a steel shaft and disk 100,000 revolutions per minute? Why not? A. It is very doubtful if a shaft and disk can be run 100,000 revolutions per minute. The difficulties are mechanical.

(4) E. E. K. asks: 1. Which is the best and cheapest way to make a water tube boiler of 12 one inch pipes 1 foot long? A. You may make a small upright boiler by plugging or welding heads in one end of the tubes and screwing the other end into the bottom of an iron cylinder, making the tube head five-sixteenths thick, the shell three-sixteenths. 2. Would it run an engine 1½ x 3? A. This will run your engine, but not with much power.

(5) C. G. L. writes: 1. In the SCIENTIFIC AMERICAN SUPPLEMENT, No. 252, there are drawings for a telescope. What is the power of one (in diameters) when the meniscus lens is used with the eye piece as described? What would be the power if the achromatic lens with terrestrial eye piece were used? If by increasing the objective double, will the power of the telescope be increased in the same proportion, and can the same eye piece be used if the focus is the same? A. Find the magnifying power of the telescope by dividing the focal length of the objective by the focal length of the eye glass, all in inches. The terrestrial eye pieces are usually of the equivalent power of a single glass from 1 to 1½ inches focus. A good way is to make a direct comparison with one eye looking through the telescope and the other looking at the object.

(6) J. H. H. writes: I am running two horizontal tubular boilers 42 inches diameter by 11 feet between tube heads, 12 square feet fire grate surface, 33 three inch tubes 11 feet long. I use them for steam heating stoves in winter season, and run one of Otis' hydraulic elevators for one floor at 1 ton of coal per week in summer, including coal to bank fire nights and Sundays. In winter the elevator is run in connection with the steam heating, when I propose to not charge elevator with coal for banking fires, as I have to bank them anyway for other purposes, but only for coal to evaporate water enough to run elevator for 1 floor, which is 175 gallons of water evaporated per day, and 26 days per month. I estimate that 1 pound of coal per 1 gallon of water is as low an amount as I can charge the elevator to the credit of the steam heating in the winter. Approximation is the only method we have at hand for determining the cost of running the elevator in the above way; we would like you to tell us what would be a reasonable estimate. A. You say that it takes 1 ton per week for elevator in summer, and you propose to charge 1.050 pounds by your figures to the elevator in winter. If you had to run the elevator alone in winter, it would take at least 25 per cent more coal than you use in summer. We think that you should charge three-fourths of a ton per week to the elevator in winter.

(7) O. C. R. writes: 1. We have an hydraulic ram working under 8 feet fall, raising water 70 feet through three-eighths iron pipe; receiving tank lined with sheet copper, tinned inside. Slight corrosion has commenced, and small holes are developed,

either from free acids or insects. Commercial sealing wax was used for stopping the leaks; is there anything better than this to cover the plates and prevent further corrosion? Also have you sufficient data to say how long the pipes (gas pipes) should last and not suffer from incrustations; length of same, 1,100 feet? A. If there are but few holes in the tank lining, the surface may be cleaned and the holes soldered up, or little patches of thin copper soldered over the holes. Then clean the tank thoroughly, and paint the inside with red oxide of iron and boiled linseed oil (Prince's metallic paint). Iron pipes if small close up by corrosion in from 3 to 6 years, according to the quality of the water. 2. We have a turret turbine that is corroded badly, and thereby prevents a free opening of gate; is there any fluid that could be put on to cut the rust and cause a free working of the gates better than kerosene oil? A. For clearing the rust from a turbine we know of nothing better than a scraper and painting as above. 3. Can No. 14 wire be used on an acoustic telephone by cabling each end securely to glass insulators and attaching smaller wire from the end of same to each diaphragm. or in other words does the sound travel through the metal or the wire move endwise in the vibrations of the transmitter? What is the best arrangement for a cheap and effective telephone, short line? A. Small wire, No. 22 to No. 24, should be used for an acoustic telephone, and connected directly to the transmitter, with sufficient resist to relieve the transmitter of undue strain. Small angles may be turned by passing around rubber suspenders. Vibrations are longitudinal. 4. Has heating by electricity been tried effectually, by whom and where, and what substances were tried as radiants for the electrical energy? A. Electricity is used only as a regulator of the heat, but does not furnish it.

(8) N. S. S. writes: I wish to paint an old building with crude petroleum. Please tell how I can treat the oil so as to make it dry readily without injuring its quality for the purpose needed. A. The only mixture that has any influence upon the petroleum as a paint lubricant may be found in resin and litharge; about 5 per cent resin powdered will be taken up by the petroleum, an equal quantity of litharge. Then add any common earth colors to thicken for a paint. The volatile part of the petroleum will evaporate, part of the oil will penetrate the wood, leaving the resin to cement the color.

(9) G. M. I.—The best arrangement for deafening floors is to have two distinct tiers of beams, one carrying the floor and the other the ceiling beneath. The ceiling beams are set lower than the floor beams, and between them. We then have the ceiling entirely separate from the floor, and there is nothing solid to carry the sound. Where this is not practicable, lay a double flooring with a layer of either concrete or felt between. The concrete will give a better result than the felt, but requires stronger beams. When the sound is to be deadened in the room containing the floor, the felt will probably give the best result.

(10) A. C. E. asks: How much internal pressure will a brass boiler 4 inches by 8 inches, one-sixteenth sheet, safely stand? A. Supposing the boiler to be 4 inches diameter, cylindrical, and 8 inches long, with raised heads, in the best form one-sixteenth inch best brass, it may be trusted to 15 pounds pressure. We do not approve of brass when copper can be had. In brazing the brass heads and seams you cannot use as strong brazing material as you can on copper, and more liable to injure the brass by burning.

(11) W. O. B.—Sodium and mercury combine readily under ordinary conditions by being brought in contact one with another. The union is attended with much hissing and spluttering. Johnson, Matthey & Co., the celebrated metallurgists of London, have a patented composition containing varying amounts of different metallic ingredients, including sodium. They prepare a concentrated amalgam, 10 pounds of which are to be used with 1,000 to 1,500 pounds mercury; the proportion of sodium employed does not exceed in all probability more than one per cent. How to make luminous paint is described in SCIENTIFIC AMERICAN SUPPLEMENT, No. 249, page 3971.

(12) O. F.—An occultation is the eclipsing of one planet by another or of a satellite by its primary. The occultation of the moon by the earth took place on October 4, visible in eastern part of the United States and Europe. It is a perfectly natural phenomenon, of often recurrence and of no import to any but cranks.

(13) J. W. D. asks how to purify crude sulphuric acid. A. By distilling in either glass or platinum retorts until perfectly pure.

(14) J. A. B.—We do not know of any chemical to mix with kerosene oil for cleaning brass. Oxalic acid and water is a powerful cleaning agent, and can be mixed with pumice stone and rotten stone for cleaning, and polish with the oil.

(15) C. J. L.—With a steam pump capable of pumping 62 gallons per minute through 1,000 feet of 2 inch pipe to a height of 100 feet you will require a 10 horse power boiler. An 8 horse power will do the work at 60 pounds pressure. The absolute power absorbed by the transit of the water is only about 2 horse power. The rest is waste, radiation, and friction of pump.

(16) H. C. C.—The usual size of saws for cutting split cord wood is from 18 to 20 inches. Your 2 horse treadmill will not drive a large saw for useful work.

(17) F. P. writes: I am using a solution of soap and water for toilet purposes; it thickens like jelly and will not flow from the bottle, while if I make it thin enough to flow it will be too thin for use. Is there anything I can add without injury to the soap that will make it flow about like molasses? A. Use glycerine or glycerine and alcohol. The exact proportions would have to be determined by experiment.

(18) J. H. W. asks: Which of two screws will stand the greatest strain—one of ten threads and the other of twelve threads to the inch; threads to be square, the thread on one end to be right hand and on the other end left hand, sliding in a nut embracing about one-third the diameter of the screw, the right

and left hand ends pulling, of course, in opposite directions? A. The question is not one of the relative strength of threaded bolts; its conditions are those of a "worm" and "worm gear." The coarser thread is the stronger.

(19) W. S. R.—The best as well as the cheapest way of using pennyroyal to get rid of fleas is to use the herb itself; the oil, of course, cannot be used where the inconvenience attending it would be greater than the evil to be overcome.

(20) T. D. & Co. ask: What is done with the dross of zinc left at the bottom of galvanizing pots? A. Galvanizing works here sell all their dross to refiners. SCIENTIFIC AMERICAN SUPPLEMENT, No. 176, gives two or three modes of treating the dross.

(21) J. A. T. asks: Is there any oil that annatto will assimilate with thoroughly, and yet not increase the thickness of the oil to any marked degree? If so, what is the process? A. Annatto is soluble both in the essential oils, as oil of turpentine, and in fixed oils. You have your choice therefore of using almost any oil you please. Cotton seed oil will probably suit.

(22) A. F. S.—There is no method of applying a permanent coating of silver without a battery. Knives are sometimes coated with tin, which gives them a white appearance something like silver. This is done by thoroughly cleaning the surface, and then dipping the knife endwise into melted tin covered with oil or wax to prevent oxidation.

(23) W. H. R. asks for a chemical or combination of chemicals which upon exposure to the light will turn instantly black. Preparations of nitrate of silver are too slow in their action to answer my purposes. A. There is no chemical, as far as we know, that will so turn black on being exposed to the light. The silver salts are considered the most sensitive in their behavior toward light.

(24) N. H. asks how long a balloon one foot in diameter is required to lift ten pounds? Also how long a balloon of eighteen inches to lift ten pounds? Also the best method to cover a balloon so as to make it gas tight. A. For 1 foot diameter, 180 feet long; for 18 inches diameter, 80 feet long. Rubber varnish is probably as good as any for balloons. See SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 312, 249, 413, about balloons and their construction.

(25) H. J. O. asks to be informed of the ingredients used in making good sporting powder, and the proportions of each used; and also what is used for glazing it, and how it is glazed. A. The exact proportions vary with the different manufacturers. According to Crookes, the following figures express approximately the composition of the best kinds of sporting powder:

Salt peter .....	74.84 per cent.
Sulphur .....	11.84 "
Charcoal .....	13.32 "

The glazing is accomplished by causing the grains to rub against each other in revolving wooden barrels.

(26) W. writes: A favorite glaze among the potters in Iowa is composed as follows:

Oxide lead .....	55
Feldspar (calcined) .....	15
Flint .....	15
White clay .....	10
Paris white .....	5

100

Practical potters differ in their opinions as to the object and effect of each of these ingredients, and also as to how their respective proportions are determined; will the SCIENTIFIC AMERICAN please explain? This glaze fuses at about 2,000° Fahr. A. Practical potters, as you say, differ as to the object and effect of these ingredients. Their use has grown up from experience, without any definite cause or reason why they should be used, more than that they accomplish the purpose. The oxide of lead probably increases the fluidity of the other substances which are used, likely as tending to produce the glaze proper. The exact proportions can easily be determined by quantitative analysis.

(27) H. A. H.—For your purpose in coating chromes we would recommend you to use wax dissolved in ether or benzine, or else take ordinary white shellac varnish and dilute it with alcohol.

(28) J. W. T. writes: How can I heat chafing dishes from boiler that now heats the house by coils of pipe, or will I have to get a separate boiler? A. You may make a flat coil, and set the dishes upon it. The steam may be made to circulate from the house-heating supply pipes for winter service. At other times a hot water circulation from the kitchen boiler may be utilized.

(29) C. V. D.—Zinc is the most sensitive of the metals. It expands and contracts two one-hundredths of an inch in 10 feet for a change of 10° in temperature. Glass expands and contracts the least. Rods of glass and zinc arranged together make a good thermostat. Also some use sheet brass and sheet iron soldered together and coiled in a helix.

(30) W. J. K. asks: Is there any way in which I can keep oysters longer than one week in a cellar, and if I can feed them in any way? A. There is no way of feeding oysters. They are best kept in a cool, damp, dark cellar, and under such circumstances they will sometimes live as long as two months, oysters generally getting fatter and better when so kept a few days. 2. A receipt for making ice cream on a small scale. A. The following is given by Marion Harland: 1 quart rich milk, 8 eggs—white and yolks beaten separately, and very light—4 cups sugar, 3 pints rich sweet cream, 5 teaspoonfuls, or other seasoning, or 1 vanilla bean, broken in two, boiled in the custard and left in until it is cold.

(31) J. S. writes for a simple method of finding the amount of water per horse power per hour consumed by an engine, by the indicator diagram, and says Haswell gives a method and example on page 572, where he says: "Volume of steam at above pressure (15.3) compared with water (15.3+14.7)=883." Where does he get the 883? A. By turning to page 574, you

will find the volume of steam for 1 cubic foot of water for pressures up to 200 pounds. A blunder in the steam tables makes it necessary to add the atmospheric pressure—14.7 pounds—to the indicated pressure in your boiler in order to obtain the tabulated volume due to the pressure. Hence 70 pounds + 14.7 pounds = 84.7. Opposite this number you will find, by interpolating the fraction, (nearly) 344 cubic feet, which is equivalent to 1 cubic foot of water at 70 pounds pressure. There is a typographical error in the sign quoted from Haswell; X should be +, which is the index for the tabular number 883. Thus for your engine we find area of cylinder 201 square inches, length of stroke 18 inches, cut off by card 0.5 inch, whole length of card 3.64 inches; then  $18 \times 0.5 = 9.07$

$3.64 \times 2.473 = 9.07$  inches—length of stroke at moment of cut off  $2.473$  inches  $\times 201$  square inches  $\times 2$  (2 half strokes) = 497 + cubic inches = volume for 1 stroke.  $4.473,000$

497 cubic inches  $\times 150 \times 60 = 447,300$ —2588 cubic feet

of steam per hour; pressure on boiler 70 lb.

atmospheric pressure 14.7 "

84.7 "

Page 574, tabular number for 84 pounds is 346, and for 85 is 342. The nearest whole number is 344, as explained above. 2588

—752 cubic feet  $\times 62.5$ , weight of a

344

cubic foot of water—470 pounds of water per hour.

470

pounds of coal per hour

pound of coal.

(32) F. D. R. asks: 1. Is there any soluble substance which can be made insoluble through currents of electricity? A. There is nothing, as we understand your question, that can be made insoluble by the electrical current. Decomposition, producing precipitation, as shown in the case of copper sulphate, results from the action of the current, but it is not the copper sulphate that is made insoluble, rather that it is decomposed. 2. Is there any chemical agent which will make a soluble substance insoluble? A. If potassium bichromate is added to glue and exposed to the light, the glue is rendered insoluble.

(33) J. R. M. writes: A friend claims that if you could put fresh ripe fruit in a vacuum, it would keep for an indefinite time. I say it will not keep a month. To put it another way: If you put fruit in a vessel and exhaust the air, how long will it keep in its natural state? A. Theoretically, the fruit would keep indefinitely, but it is an absolute impossibility to obtain any such vacuum, for the pores of the fruit are full of air. In canned fruits the cooking is supposed to destroy organic germs; then the cans are boiled to exclude air, a final pin hole being left for this purpose to be sealed up last; but even this cannot be said to absolutely get out all the air, and so there is a limit to the keeping qualities of all canned goods.

(34) A. G. asks: 1. How can I harden ordinary car spring rubber nearly as hard as soft wood, yet have it as tough after hardened as before? A. Rubber that has been vulcanized cannot be readily hardened unless it contains a greater proportion of sulphur than it should for spring rubber. In such case further vulcanization would harden it. 2. What can I mix with plaster Paris in casting small articles, to make it hard, to prevent being easily broken, to turn easily in a lathe; would like it as nearly white as possible; or do you know of any other composition or substance that can be turned in lathes? A. A small quantity of flour of marshmallow added to your plaster will render it easy to turn, and harden it somewhat. Plaster mixed in a solution of alum becomes hard on setting.

(35) P. R. writes: In a lecture recently, the remark was made that water or any fluid would flow more steadily, or produce a steadier stream, through an elastic pipe than through a non-elastic one, or in other words, through a rubber pipe than an iron one, other conditions being the same. If so, what is the reason? A. We have no data in regard to comparative flow of water in solid and elastic pipes, but if the statement is true, it must be because the elasticity of the pipe lessens the friction.

(36) J. R. T. asks how walnut furniture is polished; I mean what is termed oiled walnut, such as sewing machines and fine bedssteads. I am not a furniture maker, but would often polish walnut articles, such as wall brackets, etc. A. There is an excellent wood filler now largely used. In the absence of this, first mix with good whiting such colors as will produce as near as possible the color of the wood to be filled. This mixture to be dry. Then give the wood a good coat of oil, and sprinkle the mixture over the work until it is pretty well covered; then with a soft rag or other substance rub this in well. Wipe off all superfluous material. Let dry thoroughly, and varnish. To give the highest degree of luster to varnish after it is laid on, it undergoes the process of polishing. This is performed by first rubbing it with very finely powdered pumice stone and water; afterward rub patiently with an oiled rag and tripoli until the required polish is produced. The surface is then cleaned off with soft linen cloths, cleaned of all greasiness with powdered starch, and then rubbed bright with the palm of the hand.

(37) J. P. L. writes: Would you let me know what the average price of mushrooms is per pound, during the year in New York, and when the season for them begins and when it ends? A. The price of cultivated mushrooms at Fulton Market averages 75 cents per pound, the wild 35 cents per pound. The season of the cultivated begins about January and ends in May; that of the wild extends from August to the middle of September.

(38) C. A. writes: Can you tell me how to make a good gold ink? Can it be made out of this gold paint or bronze powder? Also a good, bright silver ink. I want an ink that can be used with an ordinary steel or gold pen. A. Gold and silver inks are made as follows: 24 leaves gold, half an ounce bronze gold, 30 drops spirits of wine, 30 grains honey, 4 crachms gum arabic, 4 ounces rain water; rub the gold with the honey and gum, and having mixed it with the water, add the

spirit; or else 1 part gold, 3 parts aqua regia; mix and evaporate until all the chlorine is driven off; cool, and mix well with ether and thicken with naphtha or essential oils. Use genuine gold leaf. For silver use either silver foil or leaf, dissolved in nitric acid, and thicken with naphtha or essential oils as described previously. You also will find in SCIENTIFIC AMERICAN SUPPLEMENT, No. 157, several recipes for gold and silver inks.

(39) J. H. N. wants to know of any one that ever was successful in making luminous yellow paint, after formula given in SCIENTIFIC AMERICAN, about a year ago. He has tried it every conceivable way, and it won't work. A. The manufacture of luminous paint will always be impracticable in this country until the exact nature of the calcium sulphide from which it is made is better understood. All that is in use at present is imported.

(40) J. R. C. asks for a formula of a black writing ink that will resist all tests. A. Dissolve 25 grains of powder gum copal in 200 grains of lavender oil by the aid of a gentle heat, then add 2½ grains of lampblack and half a grain of powdered indigo.

(41) W. B. writes: Can I not secure a constant influx of fresh air for my stable by ending a pipe in the stable and carrying the other end up a hill above building far enough to give the air a proper head? Suppose I make this pipe of 4 inches diameter, would the air rise up through one inch perforations made at various places along its course in the building? If so, it appears to me that thorough ventilation can be attained, and that with air deprived of its chill in winter and its heat in summer. What is desired in stables as well as dwelling houses is avoidance of cold draughts of air. If air will escape through perforations made in the conduit, the stable man can easily attain perfect ventilation. A. The air will draw in at the perforations, provided there is any inducement by difference in gravity between outside and inside air in the uptake. This can only be obtained by heat in calm weather. Exposure to the heat of the sun of the vertical pipe will induce a current in the pipe on a still, unclouded day. A draught cap will do well for all times when you need ventilation the least; but when there is a dead, muggy air, all devices except artificial heat fail. A 4 inch pipe for a stable is entirely inadequate to its requirements; 8 or 10 inches diameter with artificial heat in the vertical pipe is the only means of obtaining proper ventilation when it is most needed.

(42) T. G. M. S.—At present writing we do not believe that there is any demand for ozokerite in this country; there have been several companies started for the purpose of working the Utah deposits, but until satisfactory means of refining the crude mineral are found they are not likely to do much. Its uses are the same as those of wax, and principally for the manufacture of paraffine candles. See SCIENTIFIC AMERICAN SUPPLEMENT, No. 36, page 559, and also on page 640 of SCIENTIFIC AMERICAN SUPPLEMENT, No. 401.

(43) W. D. asks about the method of equipping buildings with perforated pipes, with the small holes sealed with metal that will melt at a low temperature, on the automatic shower principle. I want to know how to fit them, what size pipe is used, how far apart the holes should be and what size, and is there any patent on the principle? A. The automatic fire extinguishing apparatus, consisting of a system of pipes distributed throughout the mill, with fusible metal plugs and valve fastenings, is the subject of a great many patents, covering the details of apparatus and as much of the principle as a patent can cover. The kind that have small holes or open perforations to be flooded by opening valves in a protected place or on the outside of the building are, we believe, not now the subject of patent. It will be difficult to instruct you in the detail of these methods without an engineering study with plans of the building and the points that require particular protection; we think that you will best serve your interest by addressing the manufacturers of automatic apparatus.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

E. L. S.—The shiny flakes are graphite, a substance valuable in the arts for the manufacture of lead pencils, crucibles, stove polish, and lubricators. Its value is not very great, as it is a common mineral, and the larger factories own their own deposits.—L. S.—The specimen is pyrite, or iron sulphide, of no value.

## INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

November 11, 1884,

AND EACH BEARING THAT DATE.

[See note at end of list about copies of these patents.]

Amalgam for filling teeth, W. C. Davis .....	307,921
Amalgamating machine, centrifugal, G. W. Pearsons .....	307,982
Annunciator, electro-magnetic, A. C. Palmer .....	307,966
Artist's color holder and palette, I. W. Hey-singer .....	307,768
Automatic motor, McCraney & Johnson .....	307,785
Bag, See Mail bag .....	
Baling press, G. W. Smith .....	307,812
Banknotes and paper therefor of asbestos, manufacture of, G. T. Jones .....	307,956
Barrel, knockdown, J. H. Miller .....	307,971
Bath, combined electro, vapor, and warm air, J. B. Campbell .....	307,745
Battery, W. S. Hogg .....	307,945
Bee trap, drone, H. Alley .....	307,737
Bell, double hammer, F. O. Landgrane .....	307,860
Belt tightener and brake attachment, combined, M. W. Brey .....	307,839
Belt, woven machine, W. L. Teter .....	308,044
Bessemer converter, H. Schulze-Berge .....	307,874
Binder or fastener, metallic, J. F. Tapley .....	307,817
Boards, machine for matching, B. S. Atwood .....	307,789
Boiler, See Range boiler .....	
Bookkeeper's chair or stool, G. B. Edwards .....	307,850
Books, etc., cover for, S. Van Campen .....	307,888